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The Impact of Province-Managing-County Fiscal Reform on Primary Education in China

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Abstract

Using longitudinal Chinese county-level data from 2005 to 2007, we examine the causal effect of the Province-Managing-County fiscal reform on primary education spending by combining propensity score matching with the difference-in-difference method and allowing for the concurrent County Strengthening and Power Expansion reform. While the fiscal reform significantly increases per pupil expenditure on elementary education, there is little evidence showing that this fiscal reform narrows the urban-rural expenditure gap within counties. This Province-Managing-County reform, on the other hand, aggravates regional educational spending disparity in elementary schools based on the observation that the reform has caused a higher increase of per pupil educational spending in the affluent Eastern Region than the increase in Central and West China.

JEL Classifications: H11, H75, I22, I24

Keywords: Province-Managing-County reform, fiscal decentralization, per pupil educational expenditure, causal effect.

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1. Introduction

China's unprecedented economic growth over the past few decades has been accompanied by an alarming increase in income inequality, which is now higher than that of the United States by a significant margin, and has become a major policy concern of the government (Knight 2014; Sicular 2015; Xie & Zhou 2014). While personal and family characteristics are the key determinants of income inequality in developed economies, it is widely held that regional disparities and the urban-rural gap play much more important roles in China, as a result of China's pro-urban institutional framework (e.g. Xie & Zhou 2014). To the extent that the urban-rural gap in human capital (in both quantity and quality) drives the urban-rural earnings gap (Zhang et al. 2015), it will be interesting to study the effect on primary education spending in counties (that are largely rural) arising from a recent fiscal decentralization reform in China which has eliminated the prefecture city government as the intermediate layer between the province and the county.

The hierarchical structure of governance in China consists of five layers of governments - from the highest to the lowest: the central, province or municipality-level, prefecture or city-level (hereafter city-level), county-level and township-level (Wang et al., 2012; Tsang, 1996). Between the 1980s and the early 2000s, this hierarchical system featured a highly centralized fiscal managing system. Governments at the city level undertook a strict control of fiscal revenues and expenditures of the lower county-level governments, which in effect were the primary providers of public education for residents in their jurisdictions. The risk of this institutional arrangement is that city governments are inclined to withhold revenue sources allocated to counties and at the same time shift expense responsibilities to counties due to the priority of urban construction and development that had been pursued by most city-level governments in China (Wang et al., 2012).

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One of the consequences is that many county governments suffer from chronic underfunding of basic public services.

The central government, therefore, enacted a fiscal reform known as the Province-Managing-County (PMC) reform in 2004, aiming to lessen the fiscal stress of county governments. In contrast to the old system where county governments were strictly under the control of city governments, this reform enabled county governments to directly receive funding from the provincial government and report to the provincial government about expenditures. Specifically, the three stated goals of this reform are to (a) improve local economic development, (b) augment local finance capacity, and (c) equalize the supply of public services across counties. As the middle layer – city governments between local and provincial governments, is less likely than before to withhold sources allocated to counties and to shift expenditure responsibilities to county governments, the PMC is expected to promote fiscal decentralization in China (Wang et al., 2012).

The impact of the PMC reform on the public service delivery and regional disparity has been inconclusive in the existing studies. The proponents of the reform contend that by simplifying government administration and standardizing intergovernmental financial relationship the reform will increase the supply of public services by city and county governments (Wang & Li, 2008). The PMC reform is also found to have a positive effect on reducing the disparity of educational expenditure between urban and rural areas (Zong & Ding, 2013). The critics of the PMC reform, nevertheless, insist that the PMC reform will decrease local spending on education and public health as more resources could be redirected to productive expenditure at the expense of welfare expenditure (Liu et al., 2012).

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The reasons for the inconclusive results in the existing literature might be two-fold. On the one hand, existing research based on data from one or a couple of provinces lack national representativeness. In fact, the PMC reform was implemented in 24 provinces or equivalent administrative divisions. In addition, participating provinces may have responded differently in designing measures and institutional arrangements to redistribute responsibilities between city and county governments within the province. It is very likely that estimates may depend on the specific provinces used in the study. On the other hand, previous conventional panel data and generalized method of moment analyses do not adequately account for selection bias of the PMC reform, which is very likely to result in biased estimates of the impact of PMC reform on educational expenditure (Cai & Huang, 2010; Liu et al., 2012). In the framework of a quasi-experiment design, this article addresses both of these two methodological challenges to examine the impact of PMC reform on per pupil educational expenditure and its impact on the spending disparity between urban and rural areas. Since the Western, Central and Eastern Regions of China are quite different in socio-economic development, the effect of the PMC reform on per pupil educational expenditure gap across regions is also explored.

The remainder of the paper is organized as follows. Section 2 introduces the PMC reform. Section 3 reviews the consequences of fiscal decentralization practice across countries and sets up the research propositions to be tested in the empirical analysis. Data and empirical framework are described in Section 4. We present our results in Section 5 and the concluding remarks in the final section.

2. Background of the PMC Reform

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China has witnessed an institutional reform in the 1980s which placed county governments under the exclusive control of city governments. This institutional arrangement, in the transition time, broke the long-standing segregated development between cities and counties. For a long time, the cities had the chance to focus exclusively on the industrial development at the expense of the counties. At that time, this system change had greatly improved the efficiency of resources sharing across different administrative divisions as rural areas could not only provide food for the city population but also lease land needed for the urban expansion (Zhang, 2011). With the rapid growth of the Chinese economy, this City-Managing-County (CMC) system with too many layers and therefore with soaring costs has become increasingly incompatible with a more market-oriented economy. Liu and Alm (2016) highlight the administrative inefficiency and the widening gap between revenue and expenditure assignments at the county level. The CMC model also caused the over-industrialization of urban area and the underdevelopment and stagnant socio-economic growth of rural districts, which further reinforced the inequitable distribution of public services across counties.

Faced with all these challenges, the Chinese Central Government started the PMC reform in which the provincial government would directly manage counties, bypassing the layer of cities. The phases and key features of the PMC reform are summarized in Table 1. The most important change of the PMC reform in public finance is to allow the provincial government to simultaneously control city and county governments in fiscal revenue and public spending. The county governments now directly report to the provincial government with regard to public affairs including, but not limited to, the sharing of revenues and expenditures between local and central government, inter-governmental transfer, government budgets and final accounts. As such, the PMC reform is also referred to as “PMC flattening reform” (Li, Lu & Wang, 2016).

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The reform was first piloted in counties of provinces located in the middle and north part of China such as Anhui, Henan, Hubei, Liaoning and Jilin as listed in Table 1. In 2006, the program was expanded to Jiangsu, Shaanxi, Sichuan, Gansu, and Qinghai in Eastern and Western China. Although the Department of Finance, in July 2009, released the Opinions on Enhancing the Province-Managing-County Reform, proposing to implement this reform across all provinces except the minority autonomous regions by 2012, it seems that the PMC reform was slowed down and even at a standstill. By the end of 2012, 1099 counties from 24 provinces, representing approximately 56 percent of all counties across the country, had implemented the PMC reform (Liu, 2013).

By sorting out the inter-governmental financial relationship, the PMC reform is expected to accelerate local economic growth, to improve the financial capability of local governments, and to close the gap in basic public services between urban and rural areas. However, the extent to which the PMC reform has achieved any of these policy goals remains an open question.

The County Strengthening and Power Expansion (Power Expansion hereafter) is a simultaneous policy change that took place roughly at the same time as the PMC reform. Alongside the PMC reform which is concerned with fiscal decentralization, some provinces are also engaged in the Power Expansion for counties in aspects like local economic development and social management, in order to improve local economic performance through a flattened government structure (Li, Lu & Wang, 2016). One of the many noteworthy cases is Zhejiang Province, where the provincial government empowers the county authorities in the examination and approval of a variety of municipal and economic affairs. These affairs include, but are not limited to, the construction of infrastructure, foreign investment projects and the autonomy in the government personnel management (Li et al., 2016; Wu, 2013). This power expansion reform

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originated in Zhejiang is then gradually replicated by many other provinces for its success in motivating local governments. Since the Power Expansion reform is a policy change that provides certain discretion for local governments, it may have an effect on local spending in public education, independent of the PMC reform. In order to account for any confounding effect of the Power Expansion reform, we control for a dummy indicating the Power Expansion reform status for each county in the analysis.

3. Literature Review on Fiscal Decentralization and Research Propositions

As with studies of the PMC decentralization reform on public finance in China, the international evidence of fiscal decentralization reforms on social welfare is also inconclusive. While some states in America adopt a centralized school funding system to address the spending disparities across school districts, an increasing number of countries are devolving the administrative, fiscal and political functions of the central government to local governments (Ahlin & Mork, 2008; Brunner & Sonstelie, 2006). According to the theory of fiscal federalism (Oates, 1972, 2008), the decentralized delivery of public services at lower level of governments will improve social welfare if "there is no cost advantage associated with the centralized provision" (Oates, 2008, p.314). In line with this theory, local educational agencies would expect better educational outputs with a decentralized school finance system where local control could be achieved by empowering community members, school board, teachers, parents and students in the decision-making process (Grosskopf & Moutray, 2001). Recent evidence of the centralized school finance and administrative experiment in California implies that the centralized system is associated with the declines in school resources and student achievement relative to other states (Brunner & Sonstelie, 2006).

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The fiscal decentralization in education system certainly is not a panacea for all the contemporary issues that have been widely discussed in the field of education including cost savings, regional disparity and public service for the poor. Rather, the scholarly literature is mixed in the finding. Levin (1985) argues that when there are conflicts between local priorities and national concerns, simply replacing categorical grants with block grants would cause a waste of federal resources. The effect of decentralization on cost saving also varies by different types of educational cost. By comparing the education spending control under the province, local school board with overlapping jurisdictions, and local school board without overlapping jurisdictions, Canadian empirical experience suggests that the most decentralized regime - local school board control without overlapping jurisdictions, is associated with the lowest overall education cost while the provincial control of education spending is very limited in controlling for other education costs except for teacher costs (Landon, 1999). Similar cost saving effect of decentralization is also found in primary schools in the Philippines (Azfar et al., 1999). Surprisingly, another inference of Landon's study that the provincial control of education spending could be best at equalizing per pupil spending across districts is at odds with evidence from some other developing countries, such as China and Chile. Studies from both countries show that decentralization is detrimental to the equity of education spending across districts (West & Wong, 1995; Winkler & Rounds, 1996). With respect to the effect of fiscal decentralization on the supply of public services, fiscal decentralization in China is shown to deteriorate the accessibility to public services for the poor (Braunn & Crote, 2000). Yet in general, the authors indicate that the effect of decentralization on the public service delivery for the poor also depends on the capacity of local governments in management and the local power of the poor.

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We construct our empirical analysis by testing the following three research propositions. In the old CMC model, city government was dominant in receiving financial resources and county government only shared a small slice of the pie in the hierarchical system. With the new reform which enables provincial government to directly fund county governments, county governments are on parity with city governments in the hierarchical structure in assorted public affairs such as the sharing of revenue and expenditure, intergovernmental transfer, public finance flow, government budgeting and final accounts and annual account closing. The PMC reform thus minimizes the risk of public funding granted to local governments being withheld by city governments in the CMC model and therefore is expected to augment local finance capacity. Several previous studies have confirmed that the PMC reform is effective in increasing local finance capacity and mitigating local finance difficulties (Liu et al., 2012; Mao & Zhao, 2012). With more financial resources available, county governments are expected to spend more on compulsory education. So we come up with our first proposition that the PMC reform could positively influence the per pupil educational spending at the county level.

City governments in the mode of CMC used to focus on the development of economy in its urban area and spent larger amounts of public funding on the urbanization than the development of rural area. The over-allocation of resources to the urban and underfunding to the rural areas contributed to the deterioration of the rural-urban gap in the supply of public services (Tao, 2012). As the PMC reform designates the county government as the primary provider for the infrastructure and public services in the jurisdiction, the consequent increase in financial capacity and decision-making power through the PMC reform offers local governments a viable pathway to improve the quantity and also the quality of public services. On the positive side, since public funding can now be directly granted to county governments, it is very likely that the

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provincial governments involved in the PMC reform will attempt to coordinate the urban-rural socio-economic development by raising the appropriate rate of public transfer funding to local governments, which would then facilitate the equalization of public services within the province and coordinate rural and urban development (Jia & Yu, 2010). As allured by earlier studies, the PMC reform, which is deemed as a decentralization reform in China and may result in extra spending in infrastructure, could be detrimental to, or at best have no effect on educational spending disparities between urban and rural area on the negative side (e.g. Liu et.al., 2012; West & Wong, 1995). The second proposition of this paper, therefore, is that the PMC reform would have a non-positive effect on the rural-urban gap in elementary school spending within each county.

The Eastern, Central and Western regions of China are distinctive in local finance capacity and spending preference, which is believed to be associated with the regional spending disparity in compulsory education. Local governments with different spending preference will presumably have different responses to the improved local capacity after PMC reform. Being the most affluent region, Eastern China is not only more capable of guaranteeing adequate funding for local education but also has strong preference in securing investment in education. With even more public resources available under the PMC reform, counties in Eastern China are expected to be more likely to invest in compulsory education and social welfare system. On the contrary, less developed Central and Western China would rather spend the extra funding to accelerate the growth of local economies than improve local public services and infrastructure. The impact of the PMC reform on spending on public education, therefore, is varying greatly across regions (Liu, 2012; Luo & Yang, 2013; Mao & Zhao, 2012;) Based on this perception, we posited our

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third hypothesis that the PMC reform will aggravate the regional difference in per pupil educational expenditure.

4. Data and Empirical Framework

4.1 Data Description

To examine the effect of the PMC reform, we construct a county-level longitudinal data set from 2005 and 2007 by merging China County Statistical Yearbook and Digest of County Finance Statistics in China. The combined data set contains extensive information on socio-economic background and finance statistics of all counties across the country.

For the purpose of maintaining the consistency between the two merged data sets, we cleaned our data according to the following steps: (1) City districts, one of the main components of county-level administrative units, were excluded from the analysis as the PMC reform only involved standalone counties and county-level cities; (2) We eliminated the four municipalities – Beijing, Shanghai, Chongqing and Tianjin, as they were not the targets of PMC reform. Hainan province was originally established with the system of province directly managing counties, and therefore was removed from the sample. Since the PMC reform had been implemented in Zhejiang in the 1990s, we also dropped all counties from Zhejiang Province; (3) Xinjiang and Tibet were not included because of massive missing data; (4) Counties involved in any change in either names or administrative affiliations between the year of 2005 and 2007 were deleted; (5) Monetary units in the data set were adjusted using 2005 constant prices. After all these steps, we end up with a balanced panel of 1,526 counties and county-level cities.[1]

[1] It is worth mentioning that our sample is disproportionately rural as it excludes the 300 or so major cities (municipalities or prefecture-level cities) which manage all county-level city districts from the outset.

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Based on the process of PMC and data structure, we divide the reform into three phases: (1) In 2004-2005, only 191 counties (12.5%) were involved in the pilot reform; (2) In 2006-2007 of expansion, 265 more counties (17.4%) joined in the PMC reform; and (3) Ever since 2008, data is inaccessible even though the reform is still in effect. The subsequent evaluation of PMC reform further deleted the 191 counties participated the pilot program since we have no access to their pre-reform information.

Moreover, we have to drop any counties with missing values on the key variables in either 2005 or 2007. The final sample includes 1,296 counties which have both pre-and after-reform information available. Of these, 255, or 19.7%, were exposed to the PMC reform during our sample period.

4.2 Empirical Framework

4.2.1 Data unbalance and propensity score matching.

As the PMC reform was started as a pilot program and then expanded to more counties, it was granted advantages and disadvantages at the same time in terms of evaluating the causal effect in the analysis. On the positive side, one could always observe participating (treatment) and non-participating (control) counties at a certain time point when the reform is happening. That treatment and control groups are in the same data set with detailed information made it possible for researchers to observe the change of these two groups before and after PMC reform. On the negative side, the selection of counties in the process of PMC reform is not at random, which violates the non-ignorable treatment assignment assumption when making causal inference. As stated in the documentation, “qualified districts can experiment the PMC reform

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according to local conditions"[2]. The "qualified" means that counties involved in the reform and those not involved are differentiated in some certain traits. For instance, the initial stage of the PMC reform was manifested as "strong counties extending power", which means that strong counties with well-developed local economies and adequate public finance usually were the pioneers of the reform, thus implying systemic differences between reformed and un-reformed counties in key characteristics such as economic development, public finance, population and geographic location. In other words, the non-random (self-) selection of counties into the program introduces selection bias to the evaluation if not addressed. When the treatment and control groups are unbalanced because of non-randomly selection process, the PMC reform is no longer an exogenous but endogenous variable determined by other factors. Simply adding the reform to regression models will produce a biased estimate.

To handle this methodological challenge, this article uses propensity score matching to control for the systematic differences between the treated and untreated to achieve data balance. First of all, we employ pre-reform data in the year of 2005 to check data unbalance through identifying characteristics that the treated and untreated are systematically different in. These characteristics identified in the previous step will be included as independent variables to predict the probability of being a reformed county, i.e. in the treatment group, between 2005 and 2007. A propensity score, which has been considered as the prerequisite of a balanced data set, will be predicted from the regression. We use the traditional logistic regression to predict propensity score (Murnane & Willett, 2011).[3] The next step is to match the treated and untreated units, in

[2] Speech by Wen Jiabao (China's former Prime Minister) in the national conference on the pilot work of rural taxation and fee reform on June 6-7, 2006.

[3] We alternatively used the generalized boosted modeling (McCaffrey et al. 2004), a multivariate nonparametric data adaptive modelling algorithm, to predict propensity scores. The results are fully consistent with our main findings. These results are available from the corresponding author, upon request.

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this case, the reformed and unreformed counties, based on the predicted propensity scores. The logic of matching is to find an untreated unit in the control group as a counterfactual outcome to pair with the treated unit[4]. In this paper we choose two of the most popular methods: the Mahalanobis distance, and nearest neighbor within caliper matching (Dehejia & Wahba, 2002; Guo & Fraser, 2010). In the final step, the group of treated is matched with their counterfactual pairs found in the control group to form a new and balanced data to analyze the causal effect of the PMC.

By presenting results derived from two alternative matching strategies, we explicitly allow for a tradeoff between maximizing the common support as in Mahalanobis distance matching and maximizing the matched sample size as in the nearest neighbor matching (Murnane & Willett, 2011).

4.2.2 Combining propensity score matching with Difference-in-difference (PSM-DID)

Even though propensity score matching could balance the data based upon observed characteristics, there might be differences between the treated and untreated in many unobservable factors such as local institutional arrangement in administration and public finance, historical value and culture, and the negotiation power of local governors with supervising authorities. If these unobservable variables are correlated with the PMC reform, omitting them would also cause the problem of endogeneity and a biased estimate of the treatment effect (Chen et al., 2013; Khandker et al., 2010). To address this problem, we use our two-year matched data to estimate a difference-in-difference (DID) regression to account for these time-invariant

[4] The counterfactual outcome is the outcome of the treated had it been in the control group, which is unobservable in the data.

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unobservable characteristics. The combination of propensity score matching with DID will be referred to as the PSM-DID estimator hereafter.[5]

Using the matched panel of counties, we estimate the following DID model:

$$Exp = \beta_0 + \beta_1 PMC + \beta_2 post\text{-}reform + \beta_3 PMC \cdot post\text{-}reform + \gamma Expan + \delta X + \mu \quad (1)$$

where the dependent variable *Exp* is the per pupil education spending for each county in either 2005 or 2007. *PMC* indicates that the PMC reform has been implemented in the county by 2007 and captures the possible differences between the treatment and control groups prior to the reform time. The *post-reform* dummy indicates post-reform years and *X* represents a set of control variables. The coefficient of interest is β_3, which is the coefficient on the dummy variable equal to one for those counties participating in the PMC reform in 2007 and is the PSM-DID estimator. We also include the Power Expansion reform dummy *Expan* in the model to indicate if the county has experienced any empowerment in the self-management of local economy, social affairs and personnel. Although DID regression has accounted for unobservable factors across counties, it does not rule out the time-varying unobservable variables that could potentially bias the estimates. However, we believe that the bias in our analysis is lessened because of the two-year duration, a very short time to expect dramatic changes of the time-varying variables. As part of the process of estimating an unbiased effect, we also explore a set of time-varying variables such as assorted intergovernmental transfer in the DID regression.

Table 2 compares the means of the outcome variables between the treated and the control group, and before and after the PMC reform. It turns out that counties participating in the PMC already spend 311 CHY (US $48) more on per pupil elementary schooling than non-participating counties, even before the reform was implemented. More importantly, this difference almost

[5] It is also known as the MDID estimator in the literature (e.g., Blundell & Costa Dias, 2009; Heckman et al. 1997).

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doubled, to 594 CHY (US $91). This pattern still holds when we look at elementary school spending in urban and rural areas separately. The systematic difference across the groups highlights the importance of accounting for selectivity bias due to non-random self-sorting into the reform.

Considering that the PMC effect may be confounded by other variables, we control for three other sets of variables in our DID regressions, apart from regional dummies:[6]

(1) Factors relating to inter-governmental transfers. As the central government started a new mechanism to secure the funding for rural compulsory education in 2006, more transfer funding from central and provincial governments had been granted to support local compulsory education in fields of teacher salary, general public funding, tuition waiver, free books, construction of school buildings, nutrition plans, online learning and so forth. In order to eliminate the confoundedness of this new mechanism, we control for per pupil financial subsidy to rural compulsory education. Given that local governments may be less motivated in allocating public funding to education after receiving fiscal transfers from central and province governments, we also include the local fiscal effort in education defined as the total educational expenditure divided by total expenditure in the model.

(2) Factors relating to the demand of compulsory education. This is approximated by per household pupil enrollment and elementary enrollment in absolute numbers.

(3) Factors relating to education costs. This includes elementary enrollment and population density.

Table 2 also compares the means of these control variables between the treated and the control group, and before and after the PMC reform. Participating counties have fewer children

[6] These will be used as control variables both in a naïve DID model using the full sample of counties (i.e. without accounting for self-selection into the PMC reform), or in the DID stage of the PSM-DID analysis.

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per household and also lower population density than non-participating counties, although these gaps do not change significantly over our two-year sample period as might be expected. On the other hand, there is no significant difference in per pupil subsidy to rural education, fiscal effort or elementary enrolment across the treatment status.

5. Empirical Results

5.1 Data Balance and Propensity Scores

In the estimation of the propensity score for each county, the dependent variable is a dummy variable equal to 1 if the county is under reform and zero otherwise. Our choice of the matching variables is inspired by economic theory and previous empirical studies: importantly these variables must be measured before treatment taking place so that they are not confounded with outcomes or anticipation of treatment. We have considered three sets of matching variables as shown: (1) local economy indicators indicated by log per capita GDP, local finance capacity measured by per capita fiscal revenue, and per capita general intergovernmental transfer; (2) local demographic and labor market indicators including the shares of rural population and labor force in the Primary Sector, and (3) geographical indicators represented by regional dummy variables.

Table 3 presents the means of these matching variables in 2005 by the treatment status in 2007 in Columns 1 and 2. All the standardized mean differences in Column 3 are statistically significant at the 5% level, indicating that the sample is highly unbalanced in terms of observable characteristics before we apply matching. Counties which implemented the PMC reform between 2005 and 2007 are significantly wealthier than those who remain untreated by the end of the sample period in terms of per capita GDP, fiscal revenue and general transfer. This echoes the

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perception that wealthier counties are more likely to participate in the reform relative to poorer ones. Moreover, PMC reform participation is correlated with smaller rural population and lower share of labor force in the Primary Sector. Participating counties are also more likely to be from the Central Region compared to the Eastern and Western Regions. Column 4 shows the variance ratio for continuous variables, with all but the log per capita GDP outside the conventional acceptable range for data balance.

Table A1 in the Appendix presents the logistic regression estimates, which are used by both matching strategies.[7] Compared to counties from Western China, counties in the Central part are more likely to participate in the PMC reform, as allured in Table 1 that the PMC reform was firstly piloted in the middle part and that even almost all counties in Anhui and Hubei provinces were PMC participants without the pilot phase. Counties with higher per capita GDP are of higher likelihood to respond to PMC reform and this effect is not different across regions. Interestingly, a higher local fiscal revenue is associated with a lower probability of being a PMC reform participant for counties in Western China, indicating that counties in the West with more finance resources are less likely to participate in the PMC reform. It makes sense given that the self-insufficient counties may expect a favorable change by carrying out the PMC reform. Following the same logic, counties in Western China with higher proportion of rural population and labor force in the Primary Sector are more likely to take part in PMC reform to stimulate local economies. The association between the proportion of rural population and PMC reform

[7] Our choice of variables is systematically guided by the LR test with the help of the Stata command ***psestimate*** based on Imbens and Rubin (2015). The proportion of fiscal dependents and per capita special transfer in the original analysis were excluded. The final first order variables in the matching model are log per capita GDP, log per capita fiscal revenue, log general transfers, the proportion of rural enrolment, the percentage of labor force in the Primary Sector, and region dummies. We also include interaction of these variables and the second order of log per capita GDP and the proportion of rural population within each county.

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choice in Eastern and Central China is weaker than that in the West. Lastly, counties across all three regions that receive more per capita general transfer are predicted to have a higher probability to take part in the PMC reform. This probability is even larger for counties in Eastern and Central China.

Table 4 reports the data balancing tests of the post-matching samples. The treated and untreated counties are matched based on the estimated propensity scores via Malahanobis distance and nearest neighbor within caliper matching, using logistic regression. After matching, the sample size is reduced from 1,296 to 262 and 510, respectively. Counties from the treatment group and their counterparts from the control group are not significantly different at even the 10% level for the Malahanobis distance matching while four of variables are still unbalanced for the nearest neighbor within caliper matching due to the preservation of all counties in the treatment group.

Figure 1 shows the densities of the estimated propensity score by the treatment status, before and after applying matching under the two alternative strategies. While the non-treated group was heavily skewed towards zero before matching, there is reasonably good common support throughout the propensity score distribution for both matching methods after matching. Figure A1 in the Appendix visualizes how much of the treatment and the control are on the common support by the estimated propensity scores. For the Malahanobis distance matching, the fit is almost perfect. However, this is achieved at the expense of losing almost half of the sample.

5.2 PMC Impacts on Per-Pupil Educational Expenditure

In this section, we compare the effects of PMC reform on county-level per pupil expenditure, reported in Table 5, estimated from OLS, DID, and 4 variants of PSM-DID. With control variables including region and time dummies in the OLS regression, the PMC reform

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increases county-level per pupil educational expenditure by 296 CHY (approximately US $46). This coefficient, however, is biased because the OLS regression fails to account for the impacts of unobservable factors. The second column of the DID regression, which has accounted the time-invariant unobservable variables, reports a slightly higher coefficient of 320 CHY (approximately US $49) than the previous OLS estimate with an increase of 8.2%.

While the PSM-DID method could not account for time-varying unobservable variables, estimates are less biased than OLS and simple DID estimates. The significant and positive coefficients of reform variable indicate that counties which are exposed to the PMC reform, on average, are spending more on educating pupils in elementary schools.

For both PSM-DID strategies, we first report a baseline estimate which only controls for the Power Expansion reform and region dummies. So the difference between this parsimonious specification and the full specification with all the controls reveals the effect of the full set of additional control variables as a whole. The differences in point estimates of PMC reform between the two matching strategies indicate the sensitivity of results to different scenarios. However, they are all substantially lower than the naïve DID estimates. This highlights the importance of allowing for self-sorting when the treatment status is not randomly assigned. With respect to the two matching strategies, the first one - matching by logistic regression and Mahalanobis distance has a coefficient of 202 CHY (approximately US $31) when full controls are included, with the Power Expansion reform having a positive but insignificant effect. The corresponding full specification of matching by logistic regression with the nearest neighbor within caliper yields an estimate of 238 CHY (or US $37), with the Power Expansion coefficient being positive but insignificant. Given that the mean educational spending for each elementary pupil increases from 1,546 (US $238) to 2,633 CHY (US $405) among the treated between 2005

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and 2007, roughly one fifth of this growth can be attributed to the PMC reform. Moreover, both strategies yield estimates which are statistically significant at the 1%. Among the control variables, we find that fiscal effort has a positive effect while elementary enrolment and the share of fiscal dependents all have a negative effect. It is worth noting that per pupil financial subsidy appears to have a negative effect suggesting possible crowding out effect although the effect is sensitive to the choice of the matching strategy.

Hence our first proposition of a positive impact of PMC reform on the local educational spending is confirmed.

5.3 PMC Effect on Urban-Rural Spending Disparity

In order to examine the impact of PMC reform on the spending disparity between rural and urban area within counties, we employ the difference of per pupil educational spending between rural and urban areas as dependent variable in the DID regression. If coefficients of PMC reform are negative, one can infer that the PMC reform helps to narrow down the urban-rural educational spending gap. Theoretically, all control variables in this disparity model should also be defined as the differences between urban and rural area, but we only apply this rule to elementary enrollment and per household pupils given that we do not have within-county variation for other variables.

As shown in Table 6, the coefficients of PMC reform are insignificant with both matching strategies, and regardless of the controls for DID or for the reference Western Region. Moreover, the coefficients of the interaction term between PMC and regions are also all insignificant, indicating that the PMC effect does not appear to have differential effect across regions on the urban-rural gap. However, it is noticeable that the large negative coefficients on the Eastern Region dummy suggest that the more affluent Eastern Region counties have a lower urban-rural

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disparity in per pupil educational spending before the reform, possibly reflecting different preferences regarding provision of public services by local governments across regions.

These results are perhaps not surprising. From a policy perspective, it is even an expected outcome since the guidelines of the PMC reform do not specifically address the goal of eliminating district disparity, let alone provide detailed instructions for local governments to reduce the disparity. This finding, therefore, answers our second inquiry that the PMC reform has little effect on closing the urban-rural gap in educational spending in elementary schools. Interestingly, results across all models show that the Power Expansion reform turns out to be negative and significant at the 5% level under both matching strategies, suggesting that the concurrent Expansion reform could be more effective than the PMC reform as far as the urban-rural spending disparity is concerned.

5.4 PMC Impact on Regional Spending Disparity

We estimate a pooled specification allowing the PMC reform indicator to interact with the Eastern and Central regional dummies in this section. As suggested by Table 7, the PMC reform has a positive and statistically significant effect for the Western Region, which is chosen as the reference category. Despite a substantial lead over Western Region before the reform, the PMC reform yields an additional increase of 351 to 362 CHY ($54-56) on educational spending in the Eastern Region, depending on the matching strategy. The Central Region, on the other hand, is no different from the Western Region, in either pre-reform spending or the impact of the PMC reform. Moreover, there is some weak evidence of a positive effect of the Power Expansion reform on per pupil elementary school spending after controlling for region and treatment dummy in the model, which is only statistically significant at the 10% level under Mahalanobis distance matching. Therefore, notwithstanding an overall significant impact of the

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PMC reform on per pupil educational spending, this effect is mainly attributable to that in Eastern China, the region with better developed local economy and more affluent counties. This further justifies our third hypothesis of a growing regional inequality between regions in per pupil educational expenditure. Given the existing investment inequality in elementary schools among Eastern, Central and Western China,[8] our inference is that the province-managing-county reform is making the situation even worse.

This growing spending inequality across regions may result from the fact that local governments have quite different spending preferences. Although the primary goal of PMC reform is to "facilitate the transformation of local governments, provide better public services and promote sustainability of socio-economic development",[9] local governments in Western and Central China with more poor counties and higher pressure of improving economies are more likely to give priority to economic development than to compulsory education, public health and social security. By contrast, Eastern China with more wealthy counties and a higher level of socio-economic development, and thereby a lower demand for investment in local economics, prefers to allocate more resources to improve social welfare system. Indeed, local governments in several provinces like Zhejiang and Jiangsu, the two most affluent provinces in the Eastern Region, are competing against each other in allocating resources to public services (Huang, 2012). Considering that the local governments have already been very different in spending capacity and structure, the PMC reform of decentralization may simply amplify the differences and widen the regional expenditure inequality, which then echoes our third hypothesis.

[8] The average per pupil expenditure of Eastern, Central and Western China is 1341, 1237 and 1264 Yuan in 2005, respectively.
[9] Department of Finance of China (2009). The opinions on advancing the Province-Managing-County fiscal reform, No. 78.

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While general intergovernmental transfers appear to have a positive but weak effect on elementary education, the effect of special transfers which bears on special demands or conditions on spending is much stronger. On the other hand, the effect of financial subsidy to rural education on elementary education spending is strongly negative and statistically significant under one matching strategy, suggesting it could be crowding out other educational resources.

5.5. Robustness with respect to extending the sample period

Our sample period of two years is indeed relatively short. This might bias our estimates downward (toward zero) if the full impact of the PMC reform may take longer time to be reflected. We have managed to get two more years of data on education expenditure by counties, for the year 2003 and 2009, respectively. Figure 2 shows the trend in mean educational expenditure by treatment status for the three regions separately, and for the country as a whole. It is apparent that the year 2005 marks a turning point, after which the growth in educational expenditure accelerates and continues well into 2009. A second observation is that the PMC participants in the Eastern Region have experienced by far the strongest growth, hence likely to have driven the PMC effect for the whole sample.

Figure 3 repeats the corresponding trend in rural-urban educational spending disparity by treatment status for the three regions separately, and for the overall country. Even though the two -year estimates of PMC reform on urban-rural disparity is statistically insignificant with both matching strategies, this disparity is smaller in 2009 when rural counties spend more in elementary education. Unlike Figure 2 where counties in Eastern regions may have driven the PMC effect on per pupil educational spending, the overall change in the urban-rural gap in educational spending may be attributable to the change happened in Central China.

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However, we are unable to get the corresponding public finance variables which are needed for the matching exercise. This implies that we cannot undertake PSM-DID analysis using the extended sample. However, we are able to use the additional data to check the robustness of the DID estimates of our main sample, albeit using only basic controls including regional dummies.

The first two columns of Table 8 present the OLS and DID estimates using the 4-period extended sample. Columns 3 and 4 show the corresponding estimates using the two-period sample, which are comparable to Columns 1 and 2 of Table 5, apart from omitting all control variables except for regional dummies. It is reassuring that our main conclusion of a positive and significant PMC effect on per pupil elementary educational spending still hold, and if anything, become more pronounced when we use the extended sample. The evidence also suggests that our findings are not driven by other reforms that take place around the same time as the PMC. Interestingly, the effect of the Power Expansion reform now shows a positive and statistically significant effect on per pupil expenditure using the extended sample.

6. Conclusions and Discussion

This article explores the impact of the Province-Managing-County decentralizing fiscal reform on elementary educational spending using longitudinal county-level data from 2005 to 2007 in China. To address selection bias caused by unobservable factors, we use propensity score matching combined with difference-in-difference method to estimate the causal effect of the PMC reform on per pupil educational spending, as well as within-county spending disparities between rural and urban areas and disparities across regions. We also control for the concurrent County Strengthening and Power Expansion reform to account for any confounding effects on our estimates. Results show that the PMC reform significantly increases the amount of per pupil

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spending on education but aggravates the spending inequality across regions on the one hand, and that the evidence on the urban-rural spending disparity is inconclusive on the other.

Although the PMC reform was first initiated in several counties in the 1990s and then formally piloted in 2004, little consensus has been reached about its effectiveness ever since. We also notice that there has been little guidance about its future implementation since 2012. It is possible that provinces might be less passionate about the PMC reform on ground of the lack of concrete plan and relevant supportive programs from Chinese Central Government, which seems to be silent on whether to continue with the reform. While previous studies have shown a positive effect on local financial capacity and the growth of local economies, we contribute to the literature by showing that the PMC reform is effective in increasing local investment in elementary education. In this sense, we argue that it is still worthwhile to continue with the implementation of PMC reform.

Despite different policy practices of the PMC reform across provinces, actions taken by most provinces and local governments involved in the reform have been mostly focused on the approval, allocation, management and scrutiny of government spending. The PMC reform on its own, however, is very limited in playing a substantial role in influencing the local tax system, the share of expenditure and revenue of hierarchical governments as well as in the administrative and personnel management. The fact that local governments now directly report to the upper provincial government in public finance but fail to share the same status as city governments in administration and personnel management might prevent the PMC reform from achieving its full potential. From this point of view, the central government may consider a broader and deeper PMC reform with government administration involved. It is worth considering combining this reform with other types of institutional reforms in public finance, local tax system, personnel

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management and the division of administrative areas. It seems that the Power Expansion reform is particularly helpful in closing the urban-rural gap in educational spending from our analysis and may be of merit to be incorporated with the PMC reform in this sense. Across all government guidelines where PMC has been mentioned, we find that information on specific practical instructions for local governments is very scarce. The PMC reform might have larger effect on public services if there is a comprehensive reform plan and mission statement about the strategic goals, implementation process, supplementary policy instruments and appropriate regulations to guide through. The insignificant effect of the PMC reform on the district disparity between urban and rural areas in our analysis may partially be due to the ambiguity of equity goal in the policy design and the lack of detailed instructions of how to address the disparity in the practice.

The logit estimation of propensity score reveals that PMC reform is most likely to take place in strong counties with well-developed local economies whereas those poor ones would rather keep the old CMC model. Our first concern about the counties in the old CMC model that have been suffering a lot from the lack of public resources is that there might be growing disparities in resources across counties since PMC participants now have greater chance of enjoying a larger share of revenue and allocate even more resources to public services. Because affluent and poor counties are different in spending preferences as well - the former more inclined to invest in public services while the latter more driven by economic growth (Huang, 2012) and the Western region has disproportionally poor counties while the Eastern with affluent counties, it is very likely that the affluent PMC participants and developing PMC participants will spend more on social welfare and further enlarge the already existent regional disparity. This seems to correspond to the Matthew Effect of the PMC reform that the strong counties get

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stronger and the poor ones get poorer (Pan & Lv, 2013). Despite an overall significant effect of the PMC reform on educational spending, this PMC effect, according to our analysis, is larger in the affluent Eastern Region than that in less developed Central and Western China. Considering the aforementioned enormous differences in local financial capacity and spending preference that have persisted across regions for decades, our findings imply that the central government may need to be very cautious about the potential adverse effects of future decentralization reforms on regional disparity in the provision of public services.

Overall, our findings suggest that the PMC reform in China which tackles the highly segmented and pro-urban institutional arrangement in public finance is crucial in enhancing the capacity of local governments in elementary education investment. However, to the extent that the pro-urban institutional structure still remains intact politically and administratively, the PMC reform in public finance will have little impact on district disparity in educational spending within counties and perhaps even worsen the regional disparity. Extra cautions in the future must be taken by governments in all tiers in extending the PMC reform when there is still an absence of broader institutional changes in the current hierarchical system.

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Figures

Figure 1a. Density of the estimated propensity score by PMC reform status, Strategy I

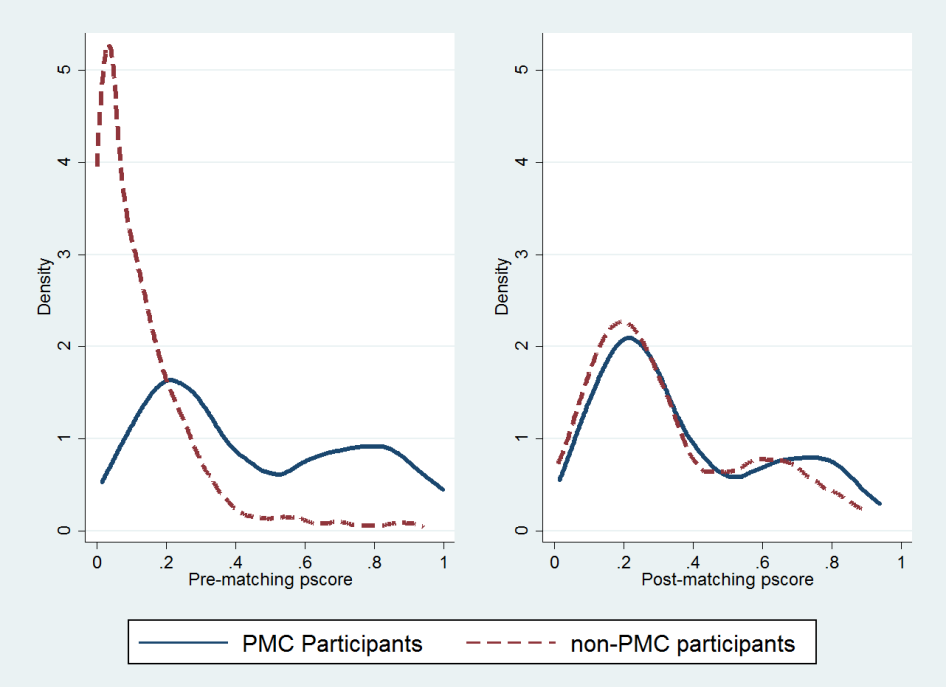
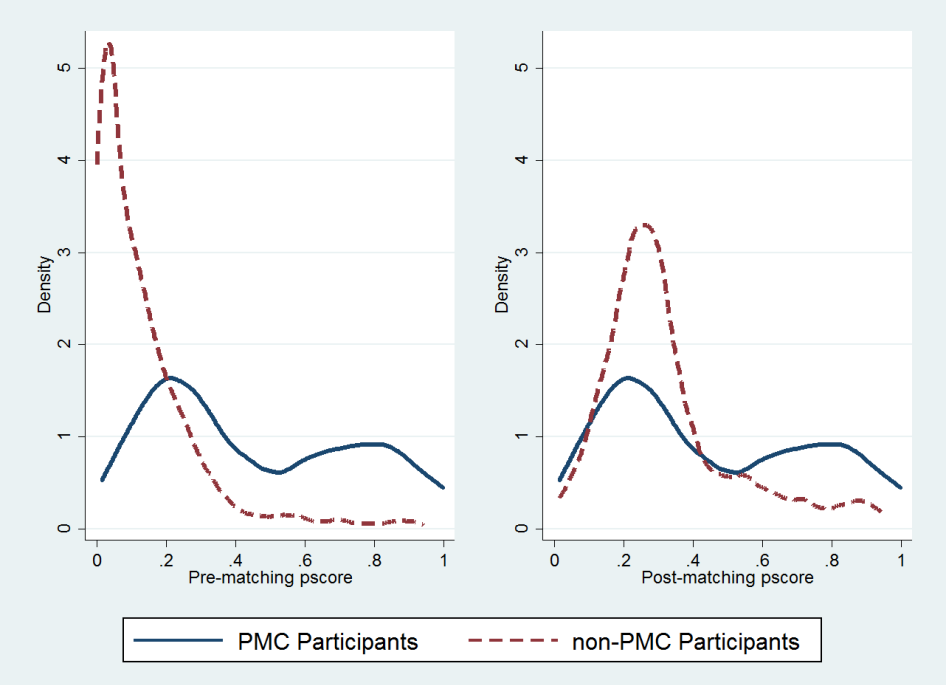


Figure 1b. Density of the estimated propensity score by PMC reform status, Strategy II



Notes. X axis is the estimated propensity score before and after matching. Data source is the sub-sample data in 2005. PMC participants are counties that take part in the Province-Managing-County reform and non-PMC participants otherwise.

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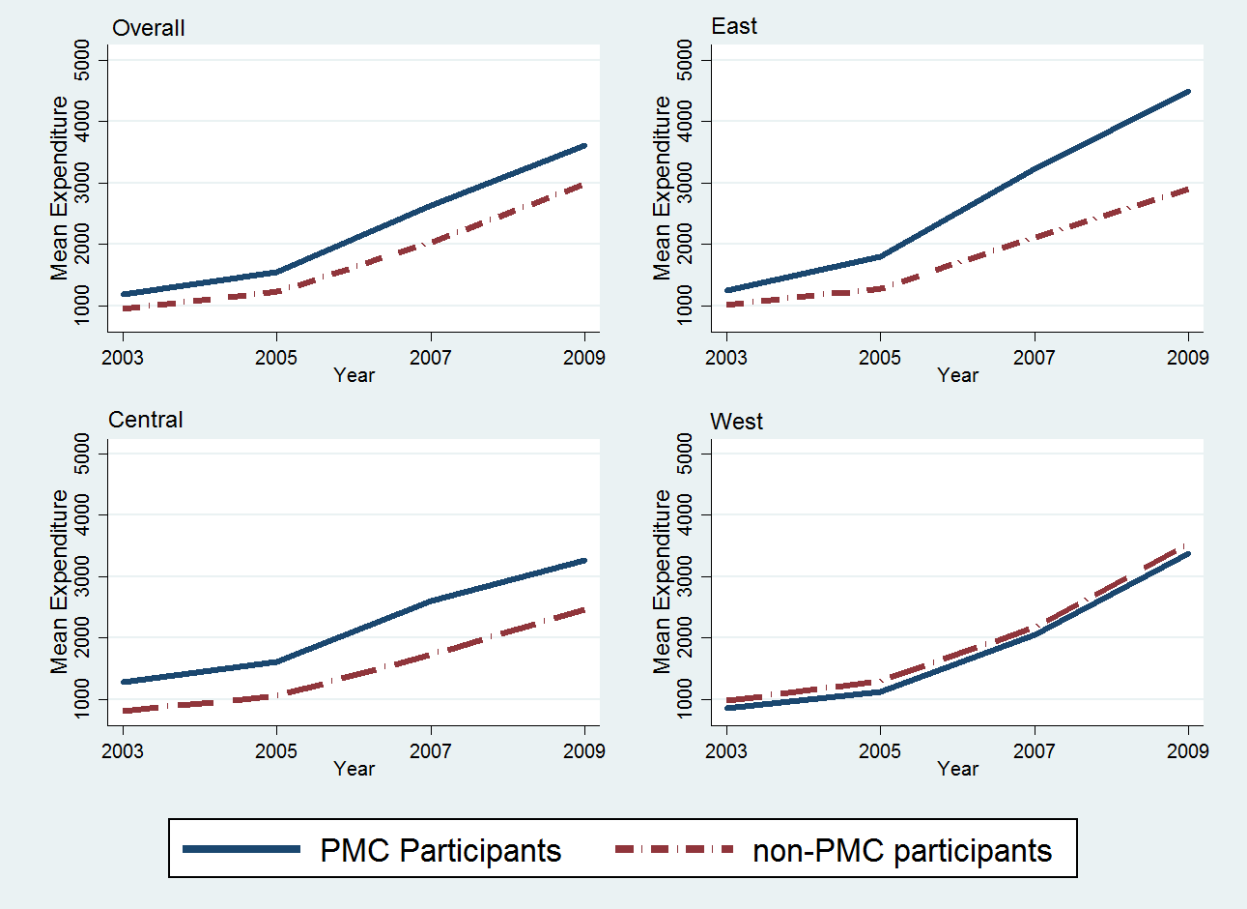
Figure 2. Educational Expenditure per pupil by Treatment across Regions



Notes. Y axis is the educational spending per pupil. Data source is the extended sample (2003-2009). PMC participants are counties that take part in the Province-Managing-County reform and non-PMC participants otherwise.

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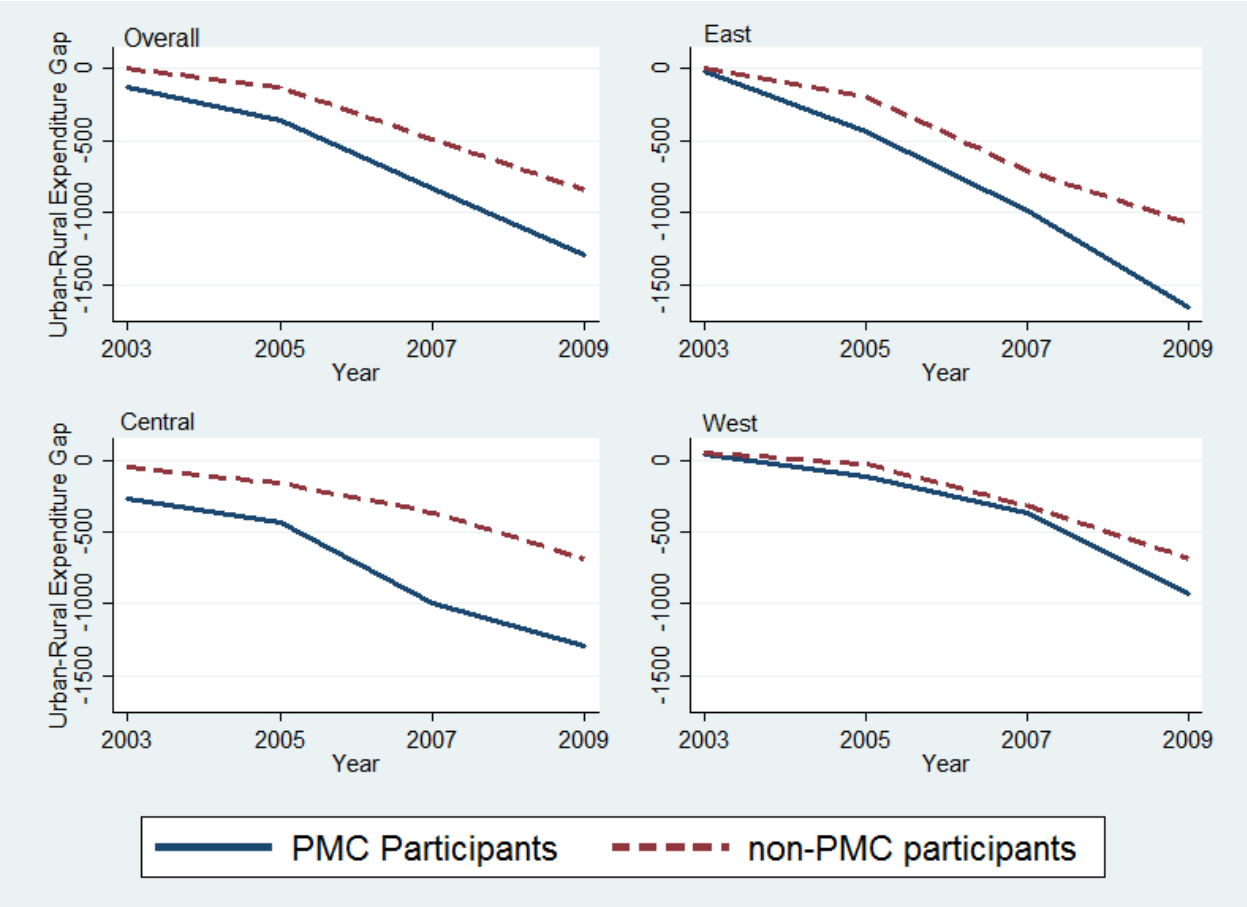
Figure 3. Urban-Rural Spending Disparity per pupil by Treatment across Regions



Notes. Y axis is urban-rural educational expenditure gap per pupil. Data source is the extended sample (2003-2009). PMC participants are counties that take part in the Province-Managing-County reform and non-PMC participants otherwise.

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Tables

Table 1. Policy Goals, Content and Participated across Phases

Phase	Primary Targets	Content	Participated Provinces
Pilot (2004-05)	Intergovernmental fiscal relationship and local economic growth	Distribution of revenue and expenditure among province-level, city-level and county-level governments, intergovernmental transfers directly from province to county	Anhui [a], Henan, Hubei [a], Hebei [b], Jiangxi, Liaoning and Jilin [a]
Expansion (2006-07)	Intergovernmental fiscal relationship, local economic growth and administrative efficiency	Include distribution of revenue and expenditure among governments, intergovernmental transfers directly from province to county, the empowerment of tax management to counties, direct report to provincial governments about local projects	Heilongjiang [a], Shaanxi, Jiangsu [a], Shanxi, Gansu, Sichuan [b], and Qinghai
Full Swing (2009-)	Intergovernmental fiscal relationship, local fiscal capacity and economic growth, the equalization of public services	Include distribution of revenue and expenditure among governments, intergovernmental transfers directly from province to county, the local discretion in the approval of local projects, the arrangement of government expenditure	Shandong, Yunnan, Guangxi, Ningxia [b]

Notes.
Reform administration stays with Department of Finance (DOF).
a PMC reform operated in all counties rather than screening pilot ones first.
b PMC reform in piloted counties started with the partial independence in the management of local economies. Local governments can directly report to provincial government for the examination and approval of projects.

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Table 2. Descriptive Statistics of Outcome and Control Variables in DID Model

Variables	Year 2005			Year 2007		
	Treated	Control	Diff.	Treated	Control	Diff.
Per pupil spending (CHY)	1,538	1,227	311.235*** (46.329)	2,623	2,029	593.584*** (66.802)
Urban	1,279	1,123	155.825*** (52.155)	2,069	1,648	420.608*** (65.168)
Rural	1,634	1,254	379.523*** (51.022)	2,903	2,137	766.922*** (86.648)
Per pupil subsidy to rural education (CHY)	41.81	44.25	-2.431 (4.401)	180.31	165.75	14.563 (14.420)
Fiscal effort in education	0.288	0.272	0.015 (0.015)	0.243	0.248	-0.006 (0.004)
Per household pupils	0.276	0.333	-0.057*** (0.009)	0.244	0.308	-0.064*** (0.009)
Elementary enrolment	39,552	42,430	-2,879 (2419.38)	35,667	40,807	-5,141 (2341.22)
Population density	0.029	0.041	-0.012*** (0.004)	0.029	0.034	-0.005*** (0.002)
Power Expansion	0.267	0.331	-0.065** (0.033)	0.412	0.399	0.013 (0.034)
Observations	255	1,041		255	1,041	

Note. Diff. = *M*(treated) - *M*(control). Standard errors of the mean difference are in the parenthesis. *$p < 0.1$. ** $p < 0.05$. *** $p < 0.01$. Summary statistics for the regional dummies do not vary over time and are reported in Table 3.

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Table 3. Descriptive Statistics for Pre-Matching Characteristics

Variables	Treated: Participants	Control: Non-participants	Std. mean diff. [a]	Variance Ratio [b]
Per capita				
GDP (log)	8.864	8.702	0.176**	0.73*
Fiscal revenue	527.8	314.3	0.188***	4.17*
General transfer	410.1	309.0	0.344***	1.61*
% of				
Rural population	0.767	0.808	-0.700***	1.88
Labor force in Primary Sector	0.268	0.315	-0.258***	1.61*
Eastern	0.243	0.405	-0.352***	--
Central	0.510	0.272	0.502***	--
Western	0.247	0.323	-0.168***	--
Observations	255	1,041		

Note. Per capita GDP is transformed to logarithm. Pre-matching information is from data in 2005.
[a] Standardized mean difference is the difference of the sample means for the treated control groups divided by the square root of the average of the sample variance (Rosenbaum & Rubin, 1985).
[b] Variance ratio is the variance of the treated group over the control (for continuous covariates). Perfect balance when standardized mean difference is zero and the Variance ratio is 1. Variance ratio in [0.78, 1.28] is acceptable in terms of data balance.

Table 4. Test for Data Balance of Post-Matching Samples

Variable	Strategy I			Strategy II		
	Mean of Counties		Std. mean diff.	Mean of Counties		Std. mean. Diff.
	Treated	Control		Treated	Control	
Per capita						
GDP	8.740	8.739	0.001	8.864	8.902	-0.041
Fiscal revenue	244.39	199.92	0.039	527.8	384.12	0.127
General transfer	323.44	295.19	0.096	410.1	342.52	0.230**
% of						
Rural enrolment	0.808	0.817	-0.075	0.767	0.809	-0.261**
Labour force in Primary Sect.	0.253	0.253	0.000	0.268	0.271	-0.014
Eastern	0.254	0.254	0.000	0.243	0.263	-0.042
Central	0.457	0.457	0.000	0.510	0.314	0.414**
Western	0.289	0.289	0.000	0.247	0.424	-0.392**
Observations	131	131		255	255	

Notes: Primary Sect.= Primary Sector. Strategy I: Logistic regression matching using Mahalanobis distance. Strategy II: Logistic regression matching using nearest neighbour within caliper. Per capita GDP is transformed to logarithm. Mean differences between the treated and the control ($M_t - M_c$) are tested. Pre-matching data is sub data sample in 2005. $^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

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Table 5. Regression Results for Education Expenditure Pre- and Post-Matching

Variables	OLS	DID	PSM-DID			
			Base I	Strategy I	Base II	Strategy II
PMC*Post reform		320.316***	310.359***	202.050***	240.821***	238.438***
		(54.196)	(80.084)	(73.102)	(67.547)	(67.350)
PMC dummy	296.159***		168.332**	156.050**	182.743	137.338
	(47.018)		(68.873)	(63.383)	(65.030)	(55.186)
Power exp.	16.116	10.749	124.924	78.382	135.294**	36.706
	(30.476)	(30.740)	(90.452)	(67.320)	(67.785)	(56.104)
Fiscal effort	343.463***	351.067***		563.428**		538.630***
	(77.195)	(74.158)		(250.798)		(101.358)
Per capita						
Gen. transfer	0.537*	0.561*		0.514*		0.592
	(0.278)	(0.287)		(0.275)		(0.404)
Sp. transfer	1.003***	1.003***		1.507***		1.077***
	(0.124)	(0.124)		(0.247)		(0.173)
Per pupil Financial subsidy	-0.285**	-0.296**		-1.469***		-0.257*
	(0.133)	(0.130)		(0.537)		(0.145)
Elementary Enrolment	-6.664***	-6.620***		-8.688***		-9.216***
	(0.624)	(0.622)		(1.383)		(1.032)
Pupils(/HH)	-1368.899***	-1375.664***		-2040.861		-2198.166***
	(158.851)	(158.738)		(354.574)		(295.770)
Pop. density	-645.527	-689.232		-1106.47		-408.847
	(439.272)	(445.833)		(780.623)		(739.825)
% of						
Fiscal dependents	-8023.441***	-8174.419***		-9366.14**		-8582.651**
	(2207.757)	(2254.428)		(4149.743)		(3673.132)
Rural enrolment	-561.654***	-556.251***		-187.453		-307.196
	(143.061)	(142.590)		(171.973)		(267.987)
Intercept	2106.786	2132.178	1028.358	1915.987	1042.267	2027.983
Region	Yes	Yes	Yes	Yes	Yes	Yes
Post reform dummy	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	189.10	184.65	110.30	58.59	168.04	102.74
R^2	0.537	0.542	0.342	0.597	0.308	0.554
Obs. *N*	2,592	2,592	524	524	1,020	1,018

Notes: Dependent variable is per pupil elementary school expenditure. Strategy I: Logistic regression matching using Mahalanobis distance. Strategy II: Logistic regression matching using nearest neighbour within caliper. Power exp. = Power Expansion Reform. Gen.= General transfer. Sp.= Special transfer. Pupils(/HH) = Pupils per Household. Pop. = Population. Dependent variable is per pupil educational expenditure in elementary school in the county level. Cluster-robust standard errors are in the parenthesis. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

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Table 6. PSM-DID Results for Urban-Rural Spending Disparity

Variables	OLS	DID	PSM-DID			
			Base I	Strategy I	Base II	Strategy II
PMC*Post reform	--	-108.031	-219.969	-235.796	0.881	-5.386
		(89.523)	(147.049)	(149.611)	(107.48)	(109.595)
PMC dummy	-150.470*	-97.153	1.532	-52.730	-21.500	-107.522
	(86.082)	(87.584)	(146.750)	(153.880)	(105.009)	(103.914)
Power exp.	-122.748***	-121.033***	-231.454**	-248.637**	-195.588**	-168.303*
	(42.432)	(42.478)	(113.414)	(96.736)	(83.373)	(91.131)
Eastern	-384.463***	-385.615***	-461.797***	-468.570***	-365.111***	-399.805***
	(57.236)	(57.269)	(142.256)	(146.393)	(200.587)	(134.818)
Central	-136.558**	-138.231**	-110.658	-155.371	-213.589***	-152.418
	(54.213)	(54.218)	(221.409)	(145.799)	(95.589)	(94.805)
Treated*Eastern	-158.555	-155.990	33.942	-176.824	-149.832	-6.534
	(142.274)	(142.410)	(211.611)	(251.907)	(200.587)	(213.572)
Treated*Central	-131.225	-129.907	-540.401**	-288.416	-225.499	-7.025
	(128.576)	(128.506)	(253.040)	(232.69)	(157.135)	(147.100)
Fiscal effort	157.752	155.035		-260.330		143.872
	(132.426)	(133.632)		(182.340)		(180.797)
Per capita						
Gen. transfer	0.055	0.046		0.120		0.107
	(0.118)	(0.119)		(0.329)		(0.157)
Sp. transfer	-0.218	-0.217		0.081		-0.119
	(0.165)	(0.166)		(0.582)		(0.243)
Per pupil						
Financial subsidy	0.199	0.203		0.798		0.314
	(0.163)	(0.163)		(1.156)		(0.249)
Urban-Rural diff. in						
Elementary enrolment	-5.378***	-5.363***		-4.658		-3.026
	(0.917)	(0.920)		(3.342)		(3.272)
Pupils(/HH)	0.025	0.001		42.657		-3.026
	(0.320)	(0.322)		(75.948)		(3.272)
Pop. density	373.757	388.125		4833.863***		1825.917
	(485.578)	(486.203)		(1652.021)		(1265.245)
% of						
Fiscal dependents	-3371.555*	-3317.662*		-2464.628		-3126.342
	(1641.818)	(1643.016)		(5443.848)		(3783.954)
Rural enrol.	97.135	96.602		999.967		334.203
	(317.698)	(317.265)		(904.297)		(707.777)
Intercept	-44.513	-53.361	60.354	-953.904	65.370	-326.218
Post reform dummy	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	22.07	20.83	9.34	8.37	15.95	10.90
R^2	0.119	0.119	0.137	0.206	0.095	0.143
Obs. *N*	2,565	2,565	524	524	1,020	1,018

Notes: Dependent variable is the difference in per pupil educational spending between urban and rural areas within counties. Strategy I: Logistic regression matching using Mahalanobis distance. Strategy II: Logistic regression matching using nearest neighbour within caliper. Power exp. = Power Expansion Reform. Gen.= General transfer. Sp.= Special transfer. Pupils(/HH) = Pupils per Household. Pop. = Population. Rural enrol. =Rural enrolment. Cluster-robust standard errors are in the parenthesis. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

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Table 7. Heterogeneous Treatment Effect across Regions

Variables	OLS	DID	PSM-DID			
			Base I	Strategy I	Base II	Strategy II
PMC*Post reform		311.045***	304.980***	206.801***	240.821***	235.398***
		(53.675)	(81.584)	(73.710)	(66.889)	(67.369)
PMC dummy	-27.407	-181.348**	-90.543	11.735	-150.737	47.918
	(79.745)	(73.671)	(139.860)	(104.249)	(116.648)	(83.611)
Power exp.	56.898*	51.254*	160.156*	119.761*	179.416*	83.988
	(29.974)	(30.192)	(92.018)	(68.810)	(68.626)	(61.666)
Eastern	173.448***	175.827***	226.302*	208.161*	389.709***	488.102***
	(42.361)	(42.259)	(126.599)	(102.979)	(122.803)	(97.340)
Central	-144.869***	-140.646***	-63.678	-31.652	36.210	30.461
	(47.804)	(47.904)	(133.638)	(108.725)	(104.438)	(78.691)
Treated*Eastern	737.310***	729.479***	343.989*	350.670*	579.984***	362.010**
	(134.011)	(134.408)	(205.838)	(184.518)	(203.572)	(174.809)
Treated*Central	290.302***	287.099***	458.907**	154.170	449.761***	24.902
	(100.072)	(100.291)	(210.529)	(161.510)	(155.638)	(114.263)
Fiscal effort	370.472***	377.576		588.269**		549.814***
	(74.325)	(71.940)		(257.297)		(102.565)
Per capita						
Gen. transfer	0.448*	0.472*		0.476*		0.549
	(0.248)	(0.257)		(0.285)		(0.388)
Sp. transfer	0.992***	0.992***		1.449***		1.046***
	(0.121)	(0.121)		(0.243)		(0.171)
Per pupil Financial subsidy	-0.241*	-0.252***		-1.213**		-0.248
	(0.123)	(0.124)		(0.597)		(0.153)
Elementary enrolment	-6.958***	-6.911*		-9.170***		-9.960***
	(0.648)	(0.646)		(1.528)		(1.165)
Pupils(/HH)	-1288.297***	-1295.682***		-1963.053***		-2014.925***
	(153.813)	(153.788)		(348.939)		(305.981)
Pop. density	-719.378	-761.099		-1125.792		-527.324
	(459.211)	(466.611)		(793.470)		(729.135)
% of Fiscal dependents	-7219.921***	-7375.012***		-8331.86**		-8115.314**
	(2038.721)	(2085.055)		(4171.751)		(3607.880)
Rural enrolment	-540.328***	-535.320***		-164.925		-310.452
	(141.345)	(140.880)		(172.639)		(269.983)
Intercept	2115.417	2139.974	1153.06	1934.986	1157.492	2031.163
Post reform dummy	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	172.52	167.94	84.05	53.87	131.76	93.03
R^2	0.549	0.554	0.355	0.602	0.320	0.558
Obs. *N*	2,583	2,583	524	524	1,020	1,018

Notes: Dependent variable is per pupil educational spending in each county. Strategy I: Logistic regression matching using Mahalanobis distance. Strategy II: Logistic regression matching using nearest neighbour with caliper. Power exp. = Power Expansion Reform. Gen.= General transfer. Sp.= Special transfer. Pupils(/HH) = Pupils per Household. Pop. = Population. Cluster-robust standard errors are in the parenthesis. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

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Table 8. PMC Effect with Power Expansion Reform in Extended (2003-2009) and Two-period (2005-2007) Sample

Variables	Extended Sample		Two-period Sample	
	OLS	DID	OLS	DID
PMC reform	516.254***	327.434***	508.997***	284.565***
	(68.940)	(68.796)	(61.173)	(49.998)
Power expansion reform	31.038	85.217**	-24.146	-28.464
	(42.460)	(41.592)	(39.039)	(39.400)
Region (Western=0)				
Eastern	-30.487	-41.329	107.895*	108.845*
	(59.011)	(59.341)	(56.330)	(56.365)
Central	-344. 650***	-350.658***	-166.864***	-165.091***
	(59.583)	(59.888)	(56.184)	(56.312)
Intercept	1007.537	1182.946	1208.546	1237.073
Time dummy	Yes	Yes	Yes	Yes
F-statistics	600.78	712.28	434.81	377.55
R^2	0.424	0.354	0.256	0.260
Observations	5,182	5,182	2,592	2,592

Notes: Dependent variable is the per pupil educational spending in elementary schools in the county level. Cluster-robust standard errors are in the parenthesis. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

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APPENDIX

Figure A.1a: Common Support Plot, Strategy I

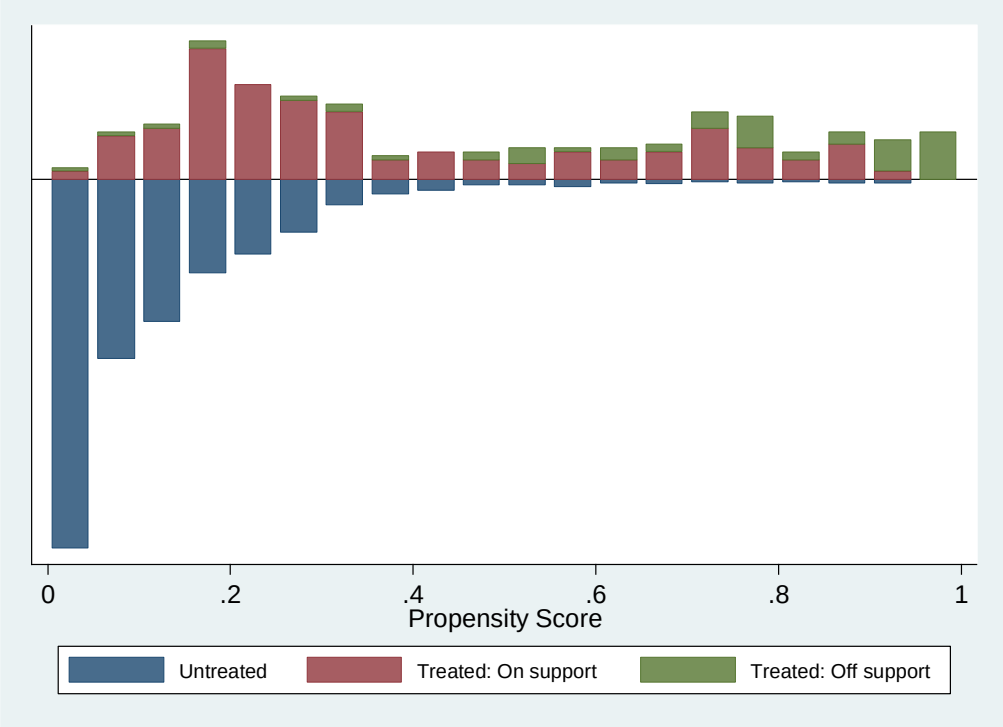
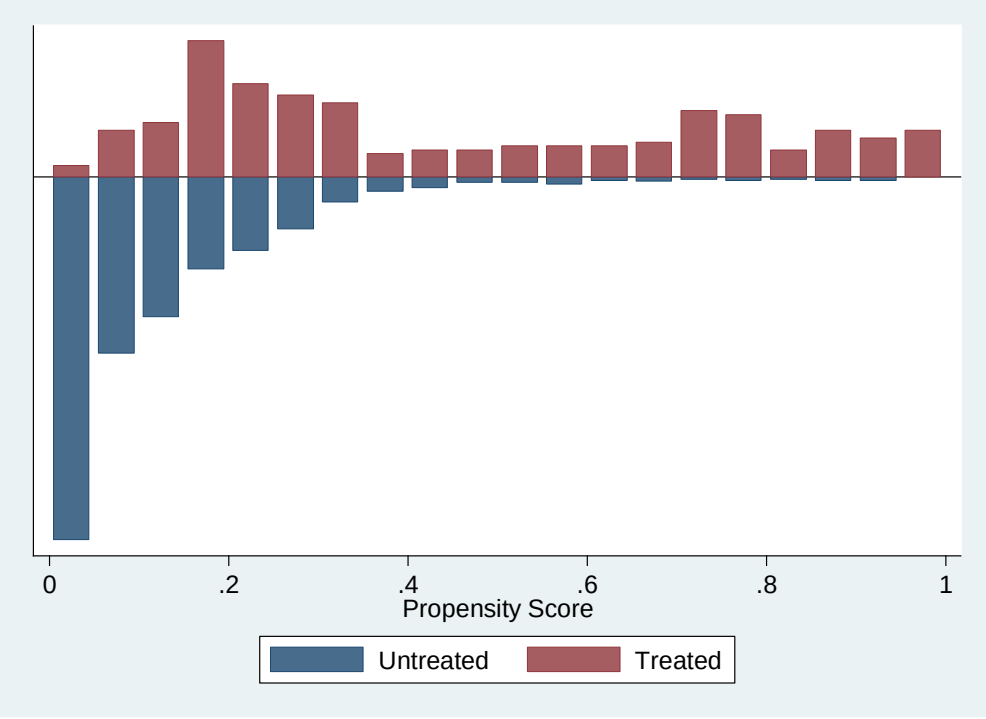


Figure A.1b Common Support Plot, Strategy II



Notes. X axis is the estimated propensity score with Strategy I. Data source is the sub-sample data in 2005.

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Table A.1 Logit Estimates for the Probability of Participating in the PMC reform

Variable	PMC reform participants Over non-PMC participants
Per capita	
GDP (log)	9.577**(4.335)
GPD quadratic term	-0.349*(0.210)
Fiscal revenue	-0.002**(0.001)
General transfer	0.011*(0.007)
% of	
Rural population	59.644***(22.558)
Rural population quadratic term	-20.489***(6.747)
Labor force in Primary Sector	15.597**(7.879)
Eastern	7.125(6.125)
Central	26.818***(4.545)
Intercept	-74.152
R^2	0.309
Observations	1,296

Notes. Interactions of any two of the pre-matching variables were included in the logit model. The sample was limited to the 2005 pre-matching data. Values in the parenthesis are robust standard errors. $^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

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Vitae

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Highlights (3-5 bullet points, max 85 characters each)

- Causal effect of fiscal decentralization reform on elementary education expenditure
- Combine matching and difference-in-difference to allow for self-sorting into reform
- Positive effect on educational spending but little or negative effect on disparity
- Allow for the concurrent County Strengthening and Power Expansion reform

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